Intertidal Tidings

Newsletter for the UW Friday Harbor Laboratories • Autumn 2011 • Volume 21

IGERT Award for Ocean Change

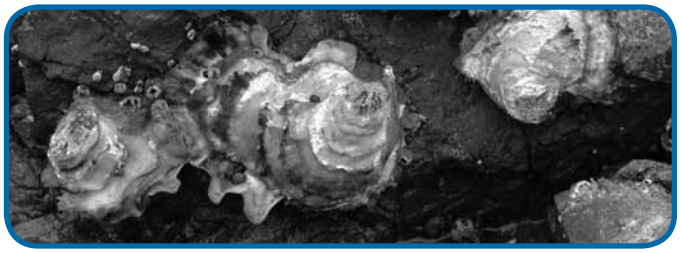
University of Washington's Friday Harbor Laboratories figure prominently in a major new award from the National Science Foundation. The IGERT award, shorthand for Integrative Graduate Education and Research Traineeship, provides $3 million dollars over five years to train 30 of the most promising Ph.D. students in the study of ocean change. IGERT fellows will receive stipends and be eligible to receive funds for research and international travel in support of their work. An interdisciplinary team of nearly 30 faculty from across UW will work together to train students to think broadly across disciplines, solve complex problems in the ocean environment, and effectively communicate their science to the public. Students and faculty from Aquatic and Fishery Sciences, Atmospheric Sciences, Biology, Forest Resources, Marine and Environmental Affairs and Oceanography will combine their knowledge to advance ocean science and address issues of ocean change.

Friday Harbor Labs will play important roles in delivery of the training program. FHL faculty helped shape the proposal and are active participants in the program. Each summer, IGERT students and faculty will convene at FHL for a summer institute to discuss the latest research on ocean change and develop new and innovative research projects. IGERT trainees will have opportunities to take summer courses and conduct research at FHL. Their research will benefit from the new and existing facilities at FHL, including the ocean acidification laboratory and mesocosms, the ecomechanics laboratory, and the research vessel, Centennial.

The theme of the IGERT program, recognizes that substantial changes are occurring in the ocean. Ocean temperature is increasing, ocean chemistry is changing and sea level is rising. In coastal areas, habitats are modified by development and water quality is altered by land-based activities. Productive fisheries have been lost, invasions by non-native species have occurred and harmful algal blooms appear to be increasing. In combination, these changes threaten local economies and livelihoods and the many benefits that the ocean can provide. The IGERT trainees will address some of these issues and will ultimately become leaders in the study of ocean change.

Photo by Julie Schram, University of Alabama Birmingham

Dr. Terrie Klinger, Professor from the School of Marine and Environmental Affairs, is the Principal Investigator (PI) on this grant, one of 18 selected by NSF from 400 submissions. Co-PIs include Dr. Kenneth Sebens (Director, Friday Harbor Labs), Dr. James W. Murray (Professor, Oceanography) and Dr. Thomas Leschine (Director, School of Marine and Environmental Affairs).



Oysters are one of the species thought to be negatively impacted by ocean acidification. Photo by Terrie Klinger.

"The scale and impacts of ocean change will rival those of climate change, but the ocean is more difficult to observe and the changes are invisible to many. Trainees will grapple with problems of ocean change that will emerge in their lifetimes and have consequences for their future."

Dr. Terrie Klinger

150 YEARS W

Friday Harbor Laboratories is proud to be part of the UW College of the Environment.

FHL Fundraising Priorities

We wish to share with you our plans to sustain FHL programs under the emerging new economic paradigm.

There are both intermediate and long-term strategies, but we are highlighting the three immediate goals:

1. **Attracting new resident researchers to FHL**
2. **Supporting FHL Postdoctoral Fellows**
3. **Providing financial support for students to attend FHL classes and conduct research**

• We are looking for the best new talent in resident researchers, and that requires partial salary and start-up funds. When new researchers become established, they bring in research grants supporting themselves, operating expenses, postdocs and/or graduate student research assistants. This is a one-time cost per position and does not require an endowment.

• Recent budget cuts mean there will not be funds to support the long-standing and very successful FHL Postdoc Program in future years. We seek to create an endowment so these important career-developing opportunities remain in place.

As we expand our resident research staff and continue to support our postdoc program, we can mentor and teach larger numbers of students. And, that brings us to our third funding priority ...

• To help students attend classes and conduct research at FHL. All students are challenged by the sizeable increases in tuition in all institutions of higher education therefore making scholarship support critical.

You can help by supporting the FHL "Adopt-A-Student" Program or by contributing to any of the FHL endowments or annual funds that offer student support. Thank you!

Dominique Roche and Sandra Binning with their professor, Paolo Domenici, Summer 2011. Photo by Flo McAlary

Adopt-a-Student

by Flo McAlary

As I was leaving the student presentations at FHL this past summer, a young woman came up to me and gave me a big hug. Her name was Becca Guenther and she asked if I remembered her. She was my "adopted" student three years ago and was back at FHL as a graduate student! She just wanted to let me know how grateful she still was for my sponsorship in Friday Harbor Labs' Marine Algae class. What a wonderful surprise! I was really moved. Sometimes we just do not realize how important our contributions are to making things happen for bright young people and how deeply it is appreciated by them.

This summer one of my student adoptees was a French/Canadian Ph.D. student from the Australian National University, Dominique Roche. He attended FHL with his wife and Wainwright Fellow, Sandra Binning. Both were part of the Fish Swimming class taught by Dr. Paulo Domenici and Dr. John F. Steffensen.

Dom, Sandra, Paulo and I shared a delightful lunch together on the dining hall deck. It was a beautiful, sunny August day, which gave us all an opportunity to enjoy the best of the northwest weather and for me a chance to hear about their studies and why they chose FHL. First, they explained their Ph.D. projects which examine how wave-driven water flow influences the ecology and evolution of fishes. Then, we turned to why FHL? Their response was ecstatic. "We have the unique opportunity to meet other students as fascinated by fish as we are and to learn from Paolo and John, who are world experts in the field from kinematics to physiology and behavior." With the costs of international travel, it would have been impossible for Dom to attend were it not for the extra financial help he received from the Adopt-a-Student Program.

Later, I was curious about how instructors viewed our efforts to bring the best and brightest to FHL. In the midst of a research project in the Brazilian jungle, Paulo responded by e-mail, "Last summer, our Fish Swimming course had outstanding students coming from as far away as China and Australia. This international collective and learning different approaches to science were absolutely fundamental in making this a high-level process."

I also heard from Dom and Sandra after the course. "We're back in Australia now, applying much of what we've learned to our own projects and the friendships and contacts we built during the course didn't end when we left FHL in August." Indeed, in collaboration with Dr. Domenici and Franziska Broell, another Ph.D. student in the Fish Swimming course, Dom and Sandra recently applied for a sustainable fishing grant to tag black marlins with accelerometers and study their swimming kinematics and recovery post release.

Sponsors are the heart of the Adopt-a-Student Program. Their generous gifts help make that match between intellect and innovative science – gifts that set bright young people off on productive and successful scientific careers.

Please join us for lunch on the deck next summer!

For information on how you can participate in the FHL
Adopt-a-Student Program
please contact
Rachel Anderson at (360) 378-2165 Ext. 2.

FHL Postdocs

Chris Neufeld. When I got the call from Ken Sebens offering me a postdoctoral position at Friday Harbor Labs, I said I needed a few days to decide. However, within minutes I knew I would accept his offer. And here's why. Independent postdoctoral positions like this are exceedingly rare, yet if the success of past recipients is any guide, these positions seem to provide two important components of early-career training: the collaborative and creative atmosphere that helps generate novel research ideas, and the intellectual independence that enables one to pursue them.

After a Ph.D. at the Bamfield Marine Sciences Centre – on Canada's West Coast – I have arrived at FHL to continue my research on how animals adapt to novel and changing environments, by studying temperature tolerance in the ubiquitous splashpool copepod, *Tigriopus californicus*. However, I also hope to contribute to the atmosphere of creative collaboration that defines FHL. Just yesterday, I had a discussion about the potential importance of non-coding DNA – while sharing an incubator – that will keep me thinking for weeks. So far, these informal conversations are as likely to take place on the dock or around the infamous TGIF popcorn machine, as they are in the lab or office. Yet they are sure to involve scientists in many disciplines and in all stages of their careers, and are always fun and often fruitful. I hope to have many more such conversations over the next few years as I carry out my research. However, I also know I have some pretty big shoes to fill; many past FHL postdocs have gone on to take faculty positions at excellent research and teaching institutions around the U.S. and elsewhere.

Dawn Vaughn. My research experience at FHL has spanned nearly a decade. I arrived at FHL in 2002 to take part in a research apprenticeship. I then spent many months over the next several years at FHL as a graduate student studying the ability of planktonic larvae to respond to changes in predation risk by altering their defensive morphologies. After a Ph.D. at the UW, and after my husband and I adopted our daughter, I returned to FHL in 2011 as a postdoctoral research associate. My position is supported by an NSF grant awarded to Dr. Emily Carrington in collaboration with a former FHL postdoc, Dr. Sarah Gilman (Grant: The effects of temperature on ecological processes in a rocky intertidal community.) My current research tests for effects of increased temperature on species performance and interspecific interactions in the sea and considers how climate change may be differentially experienced by males and females of a species. FHL provides both the biological setting and the intellectual climate for me to bridge my broad research interests, which are united by my continued fascination with how organisms cope with environmental uncertainty.

In the interest of one's career, it is often suggested that postdoctoral work be conducted at a different institution than where one receives their doctorate degree. A new intellectual environment is essential to the development of novel ideas and collaborations. However, FHL is unique in that it draws researchers from the U.S. and abroad, and from many disciplines, providing a chance to interact with a diverse group of scholars. During these interactions, which are often informal conversations, new hypotheses and novel approaches to testing hypotheses are born. This atmosphere, where shared ideas emerge from varied interests, advances our knowledge of the natural world.

As a postdoc at FHL, I am fortunate to contribute to the vibrant intellectual atmosphere of the labs. This opportunity is both essential to my development as a scientist, and inspirational as I form new and sometimes unexpected collaborations with scholars at all stages of their career. I hope to continue my love affair with FHL and the greater FHL community worldwide, as my academic career continues to evolve.

2012 FHL COURSES

Spring Quarter (March 26 - June 1)

I. **The ZOO-BOT QUARTER:**
Integrated Courses • Students Choose
- Marine Zoology and Marine Botany
- Nearshore Ecology and Physiology, Research Apprenticeship
- Developmental Biology
- Chemical Oceanography

II. Marine Genomics, Research Apprenticeship

III. Marine Sedimentary Processes, Research Apprenticeship

IV. Beam Reach Program (March 26 - June 1)

V. Organismal Biology Seminar

Summer Session A (June 18 - July 20)

I. Marine Invertebrate Zoology

II. Estuarine & Coastal Fluid Dynamics

III. Comparative Invertebrate Embryology

IV. Neuroethology

V. Functional Morphology & Ecology of Marine Fishes

Summer Term B (July 23 - Aug. 24)

I. Ecology & Conservation of Marine Birds and Mammals

II. Ecology of Infectious Marine Diseases

III. Biomechanics

IV. Marine Algae

V. Molecular Ecology & Environmental Genomics of Marine Phytoplankton

Sustainable Agriculture & Conservation Workshop on Shaw Island (non-credit, dates to be determined)

Scientific Diving (non-credit, 10-14 days, August or Sept., dates to be determined)

Blinks-NSF REU Research Internships (8-12 weeks) Includes financial support

Autumn Quarter (Sept. 26 - Dec. 7)

I. MARINE BIOLOGY QUARTER (MBQ) (MBQ students choose 3 of the following 5 courses):
- Marine Biology
- Social Change and the Marine Environment
- Ichthyology
- Ocean Circulation
- Marine Environment Research Apprenticeship

II. Pelagic Ecosystem Function in the San Juan Archipelago, Research Apprenticeship

III. Beam Reach Program (Aug. 20 - Oct. 26)

Please visit our website for a final listing of courses, course numbers and online application.

http://depts.washington.edu/fhl

Research at FHL

Harmful Algal Bloom Research at UW Friday Harbor Labs

Dr. Vera L. Trainer, Research Oceanographer
NOAA's Northwest Fisheries Science Center, Seattle, WA

What was blooming in the Salish Sea this past summer? If you saw colored water on one of your trips to the beach or during a ride on the ferry, it's likely that you observed one of the number of phytoplankton species that can form dense blooms. Red streaks in the water are often caused by the large heterotrophic (can photosynthesize and/or eat other phytoplankton) flagellate called *Noctiluca*. One way to know if you're observing *Noctiluca* is by collecting seawater in a clear jar and holding it up to the light. *Noctiluca* is a large cell (the size of a pin head) that ascends to the surface of the water. It is not harmful to humans, however juvenile fish appear to avoid *Noctiluca*.

The root-beer colored water that was observed in June and early July 2011 was caused by high numbers of other flagellated cells such as *Gymnodinium*, *Protoperidinium*, and *Heterosigma*. Most of these flagellates are harmless and an important part of the marine food web, however some can cause human sickness or death through the concentration of toxins further up the food chain. Toxins are often transferred to humans by eating shellfish where the toxin accumulates. One famous toxin, known to have been present in these waters at the time of Captain George Vancouver's visit in the late 1700s is saxitoxin, which causes paralytic shellfish poisoning in humans. The flagellate, *Alexandrium*, that produces saxitoxin, is commonly thought to cause "red tide". However, this cell rarely blooms to high numbers and does not color the water red. So, in a nutshell, red water does not necessarily mean that toxins are present.

Of the flagellates present in the Salish Sea this summer, *Heterosigma akashiwo* has killed millions of aquaculture fish since 1989, causing estimated losses to the aquaculture industry ranging from two to six million dollars. The extent of the damage to wild salmon is still unknown, but a negative impact on migrating young salmon has the potential to dramatically reduce returns to spawning streams. Over the past two decades, *Heterosigma* blooms in Southern British Columbia marine waters have been linked with poor survival of Fraser River sockeye salmon, one of the most important North American salmon runs, shared by Canadian and U.S. fishers.

The nature of the toxin, the mechanism by which *Heterosigma* kills fish with no apparent impact on other animals and humans, and the environmental factors that control its toxicity are not fully understood. This scientific uncertainty greatly hinders development of effective methodologies that ensure safe and economically secure finfish protection in the Salish Sea and other regions threatened by *Heterosigma*. There remains more work to do and this study should help significantly in this regard.

In mid-May to early-June 2011, researchers from NOAA (Vera Trainer), University of Western Ontario, (Charles Trick), University of Maine (Mark Wells) and San Francisco State University's Romberg Tiburon Lab (William Cochlan) with their research staff and students, brought their mobile harmful algal bloom rapid response laboratory (HAB LAB) to FHL to conduct a project titled: "The Ecophysiology and Toxicity of *Heterosigma akashiwo* in Puget Sound: A Living Laboratory Ecosystem Approach." The project goal is to characterize the toxins and the conditions that promote toxin production to develop strategies for mitigating the impact on wild and farmed fish.

The team examined *H. akashiwo* in its most active stages to determine what triggers its toxicity. Stationed in Friday Harbor on San Juan Island, the team collected fresh samples from developing blooms of the alga. Analysis and experiments took place at the HAB LAB, in Fernald and in Lab 10. Strong collaborations throughout the Salish Sea allowed a rapid response to *Heterosigma* blooms that occurred in the Salish Sea near Cypress Island, Eastsound, Friday Harbor, Port Angeles and Discovery Bay areas beginning in late June. A network of volunteers including fish farmers, shellfish growers, environmental learning centers, beachwatchers, native tribes and private citizens conducted weekly phytoplankton monitoring that alerted researchers and managers of *Heterosigma* bloom locations as well as any other unusual bloom events. This partnership, called SoundToxins (www.soundtoxins.org) communicates via a SoundHABs listserve with sampling coverage over much of the Salish Sea.

The project investigators will return to their respective laboratories with samples and new ideas until their next study in mid-June 2012 at FHL. They plan to run a series of controlled laboratory experiments including how temperature, nitrogen sources and trace metals affect the toxicity of the alga. The study, commissioned by the National Oceanic and Atmospheric Administration's (NOAA) Center for Sponsored Coastal Ocean Research (Ecology and Oceanography of Harmful Algal Blooms Program), is expected to continue through 2013. For more information on the project, see http://www.facebook.com/HeterosigmaHABLab.

Ready for field sampling on the NOAA research vessel Noctiluca (L–R): Dr. Mark Wells, Brian Bill, Dr. Vera Trainer, Emily Olesin, and Nick Adams
Photo: NOAA

Grant Supported Research

NEW Grants

Colliding Polymerases. Seaver Institute. PI: Victoria Foe, 2011-2014.

The Seaver Institute awarded a grant to Dr. Victoria Foe to investigate the outcome of collisions between DNA polymerases (the molecules that duplicate all the DNA in a cell once each cell cycle) and RNA polymerase II (the molecules that transcribe short discrete stretches of DNA—genes—into the RNAs that encode each specific protein). Both types of polymerase move concurrently along DNA. Foe's preliminary data hints that DNA polymerase may disrupt the transcription stop signals of actively transcribed genes and that this disruption may allow RNA polymerases transiently to read into downstream, heretofore non-transcribed DNA, thereby transiently transcribing the next adjacent gene or genes. Thus each successive round of DNA synthesis, by the collisions of DNA & RNA polymerases it causes, might trigger expression of a new set of genes. During embryo development, this could compel stage-specific gene expression to progress ratchet-like, in lock step with cell proliferation. Every plant and animal genome includes an enormous amount of DNA, called 'junk DNA' in the popular press, that does not code for proteins (e.g., 98.5 % of human DNA is non-coding), whose purpose is a mystery. The hypothesized interaction might explain this mystery since, if the interaction Dr. Foe proposes to look for occurs, the length of non-coding DNA (within and between genes) would determine the timing and level of downstream gene expression.

IGERT: Integrative Graduate Training in Ocean Change. NSF, PI: Terrie Klinger; Co-PIs: Ken Sebens, Jim Murray, Tom Leschine, 2011-2016.

See cover article for details.

Ocean Acidification Mesocosm Experiments, Educational Foundation of America. PI: James W. Murray, 2011-2016.

Dr. James Murray and collaborators received support from the Educational Foundation of America to conduct experimental studies of the biological impacts of ocean acidification and ocean warming, using the new experimental lab, which includes an indoor experimental facility, an in-water mesocosm system and a carbonate system analytical laboratory. The indoor facility can be used for experimental studies on single species. The mesocosm facility will be used to study the impact of ocean acidification on community and food-web interactions and structure. Both the indoor and mesocosm experimental facilities will have the capability of both CO_2 and temperature control so the impacts of these variables can be studied separately and together. This unique facility does not exist elsewhere in the United States. In addition to research opportunities, it provides unique education opportunities for students from high school to graduate school. The Labs' location allows experimentation on organisms native to the northeastern Pacific, where acidification already has been detected. Native species of concern include fish and shellfish species of major importance to the U.S. economy. It is essential we establish critical biological thresholds and "tipping points" for the impacts of ocean acidification on food web structure and function. These experiments include scientists with expertise in several areas: James Murray (chemistry), Bob Morris (microbiology), Evelyn Lessard (zooplankton) and Robin Kodner (phytoplankton). The funds support salaries to 1) keep the new experimental facilities operating efficiently for several research groups to use, 2) conduct experimental studies which will include a performance evaluation of the mesocosm facility, and 3) operate the carbonate system analytical lab and provide analyses of dissolved inorganic carbon (DIC), alkalinity, pH and pCO_2 for these experiments. Now completed, this facility is on track to become a major site for research and teaching on the biological and ecological impacts of ocean acidification.

Ongoing Grants Awarded to Faculty at FHL

The following list illustrates the broad range of externally funded research being carried out by UW faculty working at FHL. This is only a partial list of FHL research, since there are many visiting researchers funded by grants through their own universities.

Andersen, Robert, PI, NSF. Evolutionary relationships among heterokont algae. 2009-2012.

Carrington, Emily, PI, NSF. Effects of temperature on ecological processes in a rocky intertidal community. 2008-2012.

Carrington, Emily, PI, NSF. Co-PI: Adam Summers. Effects of ocean acidification on coastal organisms: an ecomaterials perspective. 2010-2013.

Dethier, Megan, PI, Sea Grant. Physical and biological impacts of shoreline armoring. 2010-2012. (Collaboration with UW SAFS, School of Oceanography, and Washington Dept. of Natural Resources).

Duggins, David, PI; Co-PIs: Kenneth Sebens, Charles Simenstad, Megan Dethier and James Eckman, NSF. Spatial subsidy and trophic connectivity between nearshore macrophyte production and subtidal food webs. 2009-2012.

Greene, H. Gary, PI; Co-PI: Sandy Wyllie-Echeverria, National Parks Service. Marine Benthic Habitat Mapping of the San Juan Island National Historical Park. 2010-2012.

Hanson, Bradley; Sebens, Kenneth, PIs, NOAA. Marine mammal research: R/V Centennial. 2008-2012.

Newton, Jan; Sebens, Kenneth, PIs, Washington State Dept. of Ecology. Joint effort to Monitor the Straits. 2002-2012.

Sebens, Kenneth, PI, NSF. Effects of marine preserves and nonindigenous species on rocky subtidal communities: indirect interactions, disturbance and community dynamics. 2009-2013.

Sebens, Kenneth, PI, NSF OACIS. GK-12: UW Graduate students with K-12 Teachers. Ocean and Coastal Interdisciplinary Science. 2008-2013.

Summers, Adam, PI; Co-PI: Sophie George, NSF. Research Experiences for Undergraduates: Integrative Biology and Ecology of Marine Organisms. 2010-2012.

Swalla, Billie, NSF. Beacon "Bio/Computational Evolution in Action CONsortium." Fosters interactions between computer scientists, engineers and evolutionary biologists to solve contemporary problems 2011-2012.

Wordeman, Linda, PI; Co-PI: Garrett Odell, NSF. Collaborative Research Proposal. Motor Driven Pattern Formation during Cell Division. 2010-2013.

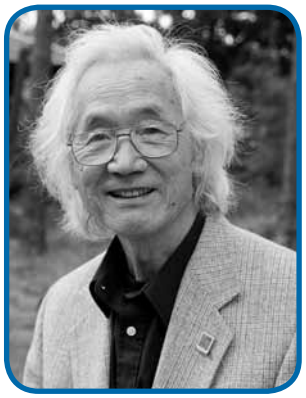
Wyllie-Echeverria, Sandy, PI, National Park Service. Water quality assessment of Garrison Bay (English Camp) and Griffin Bay American Camp. 2010-2012.

FHL Tributes

In Memory of Fu-Shiang Chia

March 14, 1931 - August 22, 2011

by Arthur Whiteley



Rarely does a person have a life so varied as that experienced by Fu-Shiang Chia. He was born on a small farm in Shandong Province, China and was only a boy when the revolution swept over China. He escaped this on foot. Have you ever walked from Seattle to San Diego? With an army interested in your whereabouts?

He made his way from Hong Kong to Taiwan. There he got his basic schooling and entered Taiwan Normal University for a major in Biology. In the late 1950's, the Zoology Department at UW received an application from him seeking admission into our graduate program. This fellow had an excellent academic record but we were at a loss to evaluate a record from an unknown (to us) Chinese university. Fortunately, UW Prof. Wellington Siang Hsu assured our faculty that Taiwan Normal University was the best university in Taiwan, and we gladly accepted him. His support was a problem. We started our new grad students as TAs to get them comfortable. Would his training mesh with ours? Would his English work? Could we use him as TA? He was interested in embryology, so he joined my lab as a research assistant, thus bypassing this issue - and starting a life-long friendship between us.

Soon Fu-Shiang discovered Friday Harbor Labs. In the early 1960's, he enrolled in Zool 536 taught by Robert Fernald and me, with the excellent David Chase as TA. This led him to select Bob as his mentor and *Leptasterias* development for his research. In those years, FHL had an open house for the town folks and tourists. Fu-Shiang was the guide for these gatherings. With his huge enthusiasm, wonderful personality, delightful rendering of Chinese-lish, and love of all these great marine invertebrates, he was a huge hit with the lay people.

Fu-Shiang received his Ph.D. in 1964 and was off to Sacramento, California for a postdoc, followed by a second postdoc at Newcastle, UK. He found his academic niche when he was hired by the Department of Zoology, University of Alberta. He became Professor, Chairman of the Department, then Dean of the Graduate School, a position he held for 10 years, and became a significant figure in Canadian academic circles. Ultimately, he retired from Alberta and in 1997, went to Hong Kong where he served for several years on the faculty of the University for Science and Technology.

Fu-Shiang and his wife, Sharon, finally settled in a home they built on Salt Spring Island. During these years, he revisited mainland China and again saw his old home in Shandong Province, where his two sisters still live. He frequently visited Taiwan where he became well known academically. He had long had a passion for poetry, and now this passion expanded. He wrote and published his own verse, but his special accomplishment was the double translation of ancient Chinese folk poetry, the Shi Jing, first to modern Chinese and then to English, thus increasing the availability of some of the foundation of Confucianism to the modern world.

When this young Chinese boy walked the thousand miles from Shandong Province, he walked right into the minds and hearts of all of us. He will always be in our memories.

At the request of his family, gifts in memory of Fu-Shiang Chia can be made to the Robert L. Fernald Fellowship Endowment. http://depts.washington.edu/fhl/help_endowments.html

Photo by Kathleen Ballard

Remembering Charles Lambert

April 10, 1935 - June 1, 2011

by Gretchen Lambert

Charles C. Lambert (Charley), Emeritus Professor of Biological Science at California State University Fullerton and ascidian biologist of international renown, was born in Rockford, IL but grew up in La Jolla, CA. Following graduation from La Jolla High School, he served four years in the Navy as a musician, playing tuba in Navy bands around the world. He then earned his BA and MS degrees from San Diego State University. Charley and I met at the Friday Harbor Labs in 1964 when we were attending summer classes; we married a few months later, transferred to the University of Washington, and Charley received his Ph.D. from UW in 1970. He carried out his NIH-funded doctoral research at the Friday Harbor Labs on Genetic Transcription During the Development and Metamorphosis of the Tunicate *Ascidia callosa*. Dr. Arthur Whiteley was his graduate advisor and remained a lifelong friend.

Charley joined the Biological Science faculty at CSUF in 1970, where he taught for 28 years before retiring in 1998. He excelled at engaging undergraduate and graduate students in projects that explored early developmental processes in marine invertebrates. Many led to student co-authored posters presented at professional meetings and peer-reviewed publications. He received the CSUF Outstanding Professor Award in 1986 and the Outstanding Health Sciences Professor Award in 1992. He returned most summers to the Friday Harbor Labs for research, and taught the comparative embryology of marine invertebrates course five times.

Charley was widely respected internationally for his work on ascidians, a small group of marine organisms considered the ancestors of the chordates. Over the course of his career, he discovered important signaling pathways associated with the early events of fertiization in both sperm and egg cells from ascidians. His significant discovery during his first sabbatical leave, at Hopkins Marine Station, of early morphological changes that occur in the ascidian sperm cell, led to numerous grant awards for his research. After retirement he continued to travel to marine labs around the world to do research, teach workshops

and give seminars. Charley organized a number of symposia on ascidian biology and was co-organizer of the First International Symposium on the Biology of Ascidians, Sapporo, Japan, 2000, and the 4th International Symposium on the Molecular and Cell Biology of Egg- and Embryo-Coats, Ise-Shima, Japan, 2004. He was a longtime member of the Western Society of Naturalists, serving as president in 1982, and also a member of American Society of Zoologists, Society for Developmental Biology, and American Society for Cell Biology.

Charley loved bicycling, and continued to play the tuba throughout his college and professional career. He was the tubist for the La Mirada Symphony for 16 years while at CSUF, and after retirement was a member of Brass Band NW for several years and the Seattle Symphonic Band for the past 13 years. Photos and tributes can be seen at http://charlesclambertmemorial.shutterfly.com/, and we welcome additions to the website.

Charley authored or co-authored 64 publications, including two this year; a number of them we published together. A complete list can be seen at http://depts.washington.edu/ascidian/. Since 1975, we published the Ascidian News, an international newsletter on all aspects of ascidian biology. We could not have attended FHL in 1964 (and thus would not have met!) without the scholarship funds we received. The family wishes to extend this help to future students: gifts can be made to the Charles Lambert Memorial Endowment at FHL, http://depts.washington.edu/fhl/help_endowments.html .

Photo by Gretchen Lambert

Dr. Megan Dethier
WSN Naturalist of the Year

The Western Society of Naturalists has named Friday Harbor Labs resident scientist and Biology research professor Megan Dethier as the 2011 Naturalist of the Year. This award recognizes "those unsung heroes who define our future by inspiring young people with the wonders and sheer joy of natural history". The awardees are usually educators, actively working in academia, who contribute substantially to teaching their students to love, appreciate and protect the wonders of nature.

Congratulations Megan!

Photo by Kathleen Ballard

Whiteley Scholars

The Helen Riaboff Whiteley Center at FHL provides a quiet retreat for scholars of all fields so they may reflect, study, write and create in a beautiful setting.

Over two hundred Whiteley Scholars were hosted in 2011. Some examples of the broad topics of their work include:

Maria Byrne, University of Sydney. Investigation of climate change stressors on marine invertebrate life histories.

David Carlton, University of Hawaii, Monoa. Collaborator: Ann Budd. Comparison of patterns of Pleistocene coral fossils from the Carribean Sea with patterns of species diversification via a molecular phylogeny.

Stephen Chatman, University of British Columbia. Musical composition related to several commissions and ongoing projects.

Douglas Eernisse, California State University Fullerton. Collaborator: Megumi Strathmann. Collaborative studies revising systematics of West Coast *Henricia (Asteroidea)*.

Gordon Fain, University of California, LA. Continued work on chapters for book on Latin epigrams.

Nancy Farwell, University of Washington. Completion of manuscript on promoting social justice through community-based learning.

Heather Greenlee, Columbia University. Drafting of manuscript from research of the effects of lifestyle modifications and use of complementary and alternative therapies after a breast cancer diagnosis.

Mary Harrington, Smith College. Completion of a scholarly review of the neurobiology of fatigue.

C. Drew Harvell, Cornell University. Continued work on a paper and research proposal on climate change and marine disease.

Suzanne Hawley, University of Washington. Astronomy retreat for work on research papers. Collaborators: Adam Kowalski, Jim Davenport, Sarah Schmidt, and John Bochanski.

Robert Kaplan, Albert Einstein College of Medicine. Study of the role of acculturation in the prevalence of development of disease and risk factors playing a protective or harmful role in Hispanics/ Latinos.

Karen Kingsolver, Duke University Medical Center. Development of modules for a leadership development program for Academic Physicians.

Brad Leithauser, Mount Holyoak. **Mark Leithauser**, National Gallery of Art. Collaboration on book, "Good and Gone: Laments for Lost Things."

Edward Miles, University of Washington. Drafting a plan detailing how NSF Science and Technology Center, an IGERT program, and a Regional Coordination Network for the Northeast Pacific Ocean will work together.

Sarah Morley, NW Fisheries Science Center. Collaborators: George Pess, Martin Liermann, and Todd Bennett. Writing retreat to focus on completing scientific manuscripts on the research of ecology and management of freshwater and estuarine systems.

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Bruce Nelson, University of Washington. Development of an Exploration Seminar focusing on the geology and geomorphology of Corsica.

Linhui Peng, Ocean University of China. Writing based on research of ocean accoustics including sound wave scattering and propagating in the ocean.

Jeff Vervoort, Washington State University. Writing of two chapters for Treatise of Geochemistry.

FHL Science Outreach

YOUNG INVESTIGATOR PRIZE

FHL is pleased to announce that three Young Investigator Prizes were awarded for the 2011 summer season. **Audrey Olshefsky** was awarded a full-time summer internship. Two part-time summer internships were awarded to **Shaughn Anderson** and **Robin Gropp.** The Young Investigator Prize is the culmination of the **Friday Harbor Labs Science Outreach Program (FHLSOP)** which has been providing experiences that foster local K-12 students to become environmentally aware and scientifically educated stewards of our local marine and freshwater environments since 2001. The prize is awarded to motivated high school juniors or seniors showing exceptional promise in the fields of Science and Mathematics.

Audrey, a senior at Friday Harbor High School, worked as a research assistant this summer in the subtidal community ecology laboratory at FHL with a team of scientists headed by Dr. Ken Sebens. Audrey assisted with a number of ongoing projects including analyzing photo surveys of large mobile invertebrates and fish in San Juan channel to track long-term changes in distribution and abundance; identified and processed organisms obtained from rocky habitats to study impacts of predators on benthic organisms, and served as surface support for diving operations.

Shaughn, a senior at Friday Harbor High School, assisted Christina Bonsell, the REU mentored by Dr. Peter Swarzrnski and Sandy Wyllie-Echeveria, in a project to assess Ground Water Discharge in the San Juan Archipelago. Using the Scanning Electron Microscope (SEM), Shaughn continued (work he began the previous summer) to characterize fine structure in the three species of seagrass (*Zostera marina, Z. japonica* and *Phyllospadix scouleri)* that are the focus of investigation by the Seagrass Lab at FHL. He also contributed to scientific papers co-authored by Sandy Wyllie-Echeveria and Adam Summers and presented a poster at the 2011 Salish Seas Ecosystem Conference in Vancouver, British Columbia.

Robin, a senior at Orcas Island High School, also worked with Dr. Ken Sebens and his team. Using digital photo analysis techniques and photos from the 1970s and 2000s, he tracked recruitment, growth and death rates of the native cold-water cup coral *Balanophyllia elegans* to explore effects of climate change on these organisms. Additionally, Robin served as surface support for diving operations and assisted with a lab experiment addressing cup coral growth rates.

All three students were excited and honored by the opportunity to work at the UW world-class research station at Friday Harbor Labs. They found their work to be extremely interesting, meaningful, rewarding and enjoyable. Each student plans to pursue further education and a career in a scientific field. The FHL scientific teams were very pleased with the contributions and the enthusiasm these assistants showed toward their projects during their summer internships.

A job very well done.
Thank you Audrey, Shaughn and Robin.

Orca Bowl

Friday Harbor High School's "Team A" took first place at the 2011 Orca Bowl, the regional competition of the National Ocean Sciences Bowl. The annual competition challenges and recognizes students' knowledge of the world's oceans. The FHL Science Outreach Program and the FHL (NSF) GK-12 Program educate all local students on this subject. To prepare for the Orca Bowl, the high school team challenged Friday Harbor Labs' scientists to friendly practice competitions. As first place winners, all team members qualified for UW Oceanography scholarships.

Congratulations Friday Harbor Orca Bowl Team!

Photo: Team members and coach (left to right) Nicki LeBaron, Elle Guard, Audrey Olshefsky, Nick Roberts, and Gavin Guard. Nick Frazee (far right) and Marc Vermeire, both Friday Harbor High School teachers, were the coaches.

Photo by Robin Ricks

ROV Competition

FHL steps up for K-12 STEM Education

Friday Harbor High School students placed third in their first-ever appearance at the regional Marine Advance Technology Education competition in Renton, WA in May 2011. FHL's NSF GK-12 Program provided financial and logistical support for the team of six, who spent several months constructing their own ROV (remotely operated vehicle) that completed a series of underwater tasks. The ROV club will soon begin preparing a new "Bot" for the 2012 competition.

Team members (left to right): Matthew Skeels, Alex Halliday, Nathan Henderson Nick Roberts, Nicki LeBaron and Michael Barsamian

Support the Friday Harbor Labs Science Outreach Program FHLSOP online at

http://depts.washington.edu/fhl/help_endowments.html

Thank you for your Support

We wish to acknowledge our many contributors for their kind and generous support of students and programs at FHL.

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E-newsletter

Are you interested in keeping up with FHL news? Please contact us to be added to the mailing list.

We appreciate hearing from FHL "alums" and would like to include your news in future e-newsletters.

Contact address: fhlnews@uw.edu

From the Director's Office

FHL Postdoc Program

by Ken Sebens

For the past several decades, FHL has supported a program of postdoctoral researchers that is unique in the nation. Generally, one or two postdocs have worked at FHL, collaborating with FHL and visiting scientists, and teaching when the need and opportunity arose. They have had the independence to design their own research program, but can utilize the resources of FHL and of individual faculty laboratories. Their experience at FHL is thus quite a bit different than that of postdocs supported on individual research grants, working in one research lab. These young individuals come with fresh ideas, they integrate experiences from other labs into the FHL research and teaching environment, and are immediately relevant to graduate students and undergraduates who benefit from their advice and mentoring. The postdoc is thus a key transitional phase in the training of new scientists – being mentored as they launch their career, and mentoring others that are coming along. As graduate students, they experienced their first chance to design their own research projects, but often as part of a laboratory group where the direction was somewhat determined. As postdocs, especially FHL postdocs, they have a chance to try new directions and follow paths that might lead down blind alleys, or into caves filled with treasure. The point is, they have the opportunity to explore and to determine their own path. By providing these positions, FHL can fill a gap in the mentoring ladder, between being a grad student and being an assistant professor or beginning researcher.

At FHL, research started by postdocs has led to new funding opportunities for them, and for their collaborators in several cases over the past five years. Often FHL postdocs, once successfully ensconced in academic positions, find that it is easier to continue their research at FHL in summers than to work in places with less access to the right creatures and habitats. It is hard to imagine a time when there will not be new FHL postdocs stepping off the ferry, thinking about what they want to accomplish for the next two years. But, given the way the state budget has been going, that will soon be the case. FHL postdocs now teach during one quarter of the year, giving them valuable experience in that career skill, as well as bringing fresh ideas that invigorate our teaching program. However, the discretionary teaching budget has taken the hardest hit over the past three years. Because of the imminent loss of those funds, that have supported the FHL postdoctoral program, the FHL Advancement Board and FHL Director are seeking funding to initiate an endowment that will keep the program going, and maybe expand it some day. We imagine a strong, competitive, national and international program with two or more postdocs at FHL at all times. Such a program would have national prominence, and would ensure that FHL continues to be a leader in preparing the next generation of marine scientists. Think about such a program and the opportunities it would provide for your own graduate students, whatever university you are part of. If you can help us get this endowment started, we would love to hear from you.

FHL Funds, Endowments and Scholarships

Adopt-A-Student Program Fund
Supports FHL students with tuition, housing, food and travel costs.

Alan J. Kohn Endowed Fellowship Fund
Supports graduate study of invertebrate biology through research or course work at FHL.

Anne Hof Blinks Fellowship Endowment
Supports students, including those of diverse under-represented backgrounds in their studies in Marine Ecology at FHL.

Brooks and Suzanne Ragen FHL Endowed Scholarship
Provides financial assistance to graduate and undergraduate students at FHL to conduct research or to be enrolled for a class or workshop in marine sciences.

Emily Carrington Endowed Student Travel Support Fund
Provides support for undergraduate and graduate students at FHL for expenses related to student travel.

Charles Lambert Memorial Endowment
Provides assistance to graduate students for research and/or coursework at FHL that includes cell or developmental biology of marine invertebrates or ascidian biology.

Christopher G. Reed Endowed Fund
Offers scholarships to undergraduates for study of marine sciences at FHL.

Dennis Willows Director's Endowed Professorship
Enhances the UWs ability to attract and retain a distinguished FHL Director by providing discretionary funds to the Director for unbudgeted needs including student assistance.

Ellie Dorsey Memorial Fund
Generates funds for an annual gift to a scholarly student in memory of Ellie Dorsey.

Ellis Preserves Fund
Supports activities in research and education connected to the Ellis Preserves on Shaw Island in honor of Marilyn and Frederick Ellis.

FHL Discretionary Fund For Excellence
Provides funds for student aid and encourages diverse initiatives that benefit FHL.

FHL Research Fellowship Endowment
Provides graduate student support to students and post-docs involved in marine science studies and research at FHL.

Research Apprenticeship Program Endowment
Supports the Research Apprenticeship Program, which pairs undergraduate researchers with faculty mentors for unparalleled, intensive learning about the nature of research.

FHL Research Apprenticeship Program Annual Fund
Supports FHL students in the Research Apprenticeship Program with tuition, housing, food and travel costs.

FHL Science Outreach Program
Supports staff, equipment, supplies and research vessel Centennial use connected with educational outreach for local (K-12) school partners.

FHL Graduate Research Fellowship Endowment
Provides graduate student support to students and postdocs involved in marine science studies and research.

Karel F. Liem Fish Biology Endowment
In honor of the prominent ichthyologist and member of the FHL teaching and research community, this fund supports research on fishes.

Larry McEdward Memorial Fund
Supports graduate study or coursework in invertebrates, embryology, evolution or development of marine organisms.

Marine Field Equipment Endowment
Provides support for FHL to support and maintain marine field equipment.

Marine Life Endowment
Supports FHL fundamental courses: Marine Invertebrate Zoology, Marine Algae/ Botany, Comparative Invertebrate Embryology and Marine Fish Biology.

Marine Science Fund
Supports students entering the Marine Science field through programs at FHL.

Mellon Mentors Endowment
Enhances UW's ability to attract, retain, and provide opportunities for professional development for FHL faculty who will mentor underrepresented minority students.

Paul Illg Distinguished Lectureship Endowment
Brings specialists to present lectures on invertebrate biology.

Patricia L. Dudley Endowment For FHL
Supports research and scholarships for the study of systematics and structure of organisms and marine ecology.

Reed Undergraduate Endowment
Offers scholarships to undergraduates for study of marine sciences at FHL.

Richard And Megumi Strathmann Endowed Fellowship
Supports graduate students' studies and research of the organisms, physical environment, or geology of the San Juan Archipelago and adjacent regions in the NE Pacific Ocean.

Robert F. Fernald Fellowship Endowment
Provides support for graduate students of comparative invertebrate embryology.

Seagrass Conservation Project
Supports ongoing seagrass conservation studies by Dr. Sandy Wyllie-Echeverria.

Kenneth P. Sebens Endowed Student Support Fund
Provides support for undergraduate and graduate students at FHL.

Stephen and Ruth Wainwright Fellowship Endowment
Provides fellowships to graduate students studying form and function of organisms.

University of Washington
Friday Harbor Laboratories
620 University Road
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CHANGE SERVICE REQUESTED

Paul Bordillon with first grader. Photo by David Haas

Marine Biology Students on R/V Centennial Fieldtrip. Photo by David Haas

FHL Students in the Classroom

Since 2009, Jenny Roberts, Director of the Friday Harbor Labs Science Outreach Program, and Dr. Emily Carrington in collaboration with her FHL Marine Biology students, have brought science investigation to the **first grade classes** of the Friday Harbor Elementary School. The first graders work one-on-one with the Marine Biology students (scientists) using loupes to magnify their world by 5X. With the assistance of their own private UW scientist, the first graders learn that science can be fun and develop scientific skills, such as making observations and formulating hypotheses.

Your support is appreciated!

With decreased state funding and increased tuition, now more than ever, we could use your help. If you are able to send a donation, or make a gift online, we would be very grateful. If you'd like more information about supporting FHL, please don't hesitate to contact us.

- **Ken Sebens, Director, sebens@uw.edu**
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To make a gift online please go to:
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